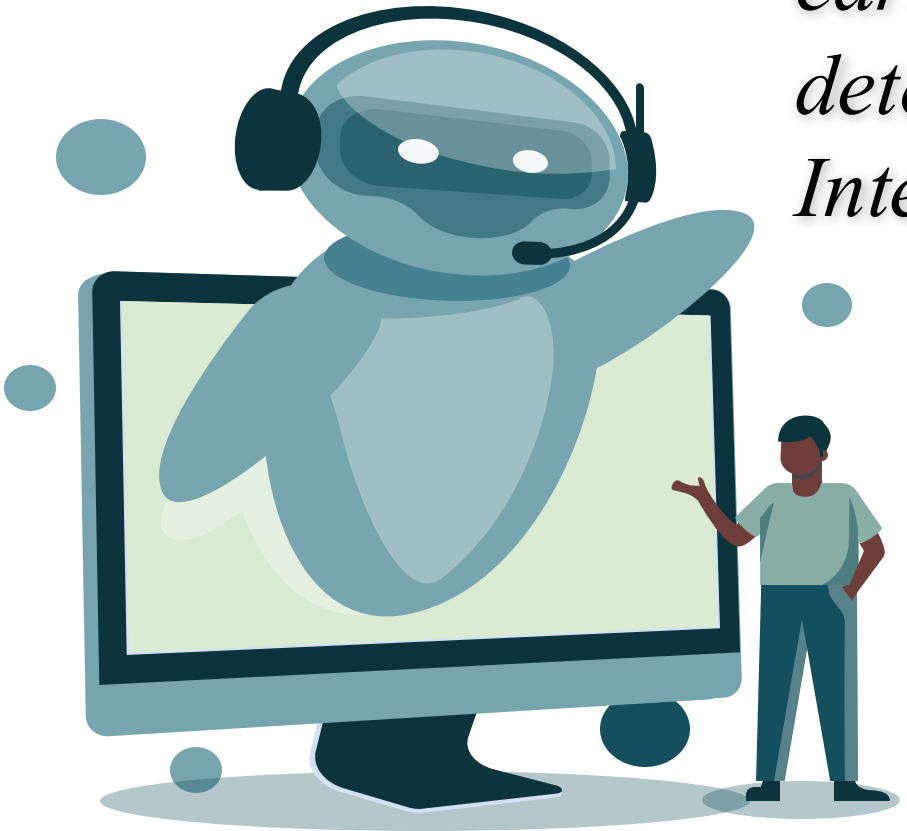
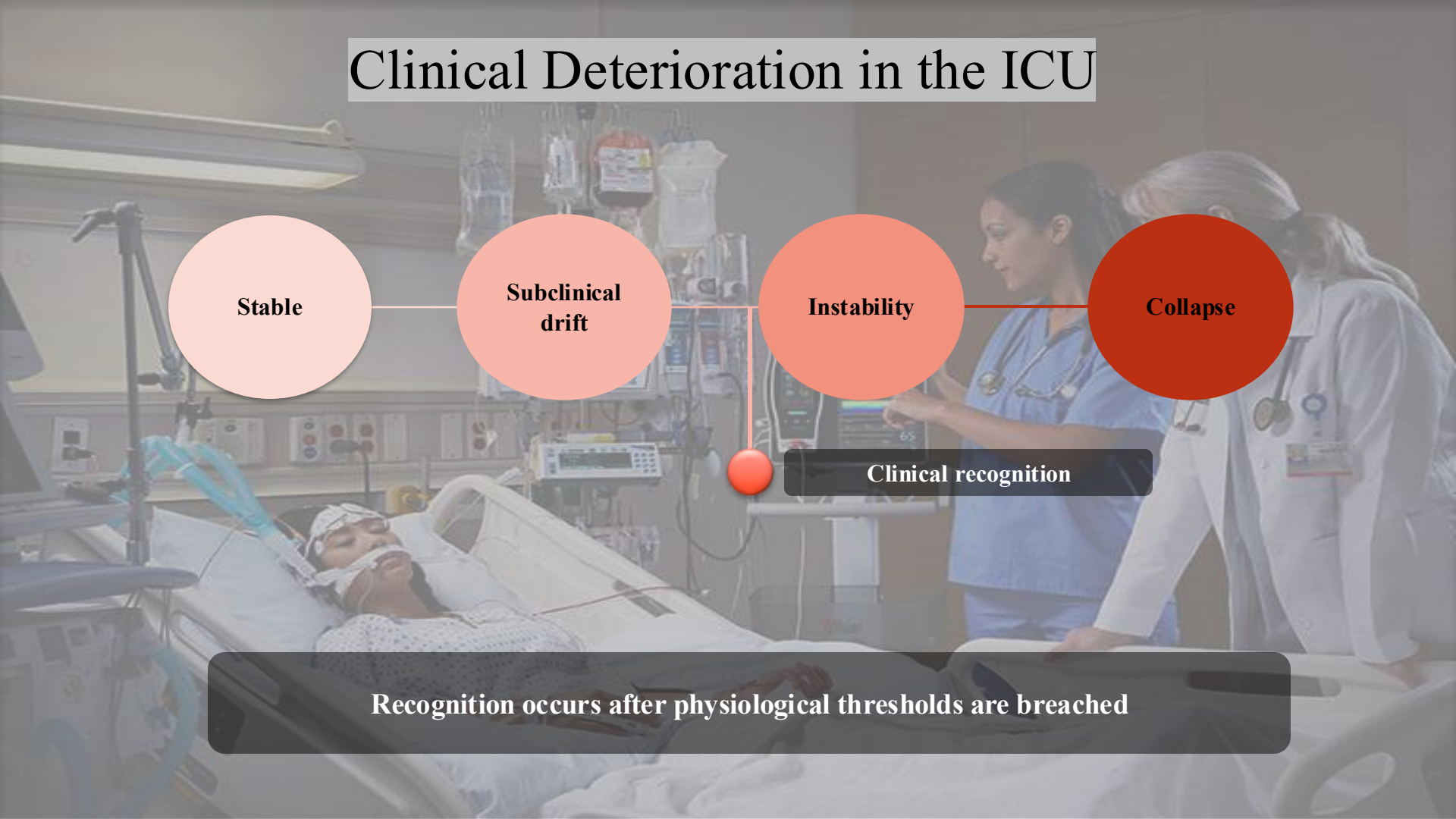


Artificial Intelligence for early prediction of clinical deterioration in Intensive Care Units

Jeevika Jairam
East European University
Student scientific workshop 2026

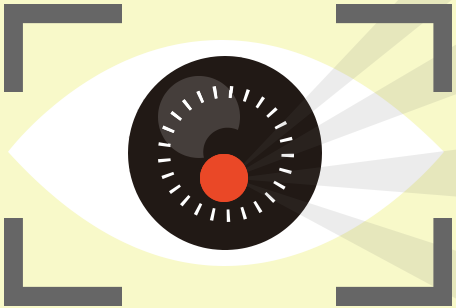
Clinical Deterioration in the ICU



Recognition occurs after physiological thresholds are breached

Traditional Scoring System

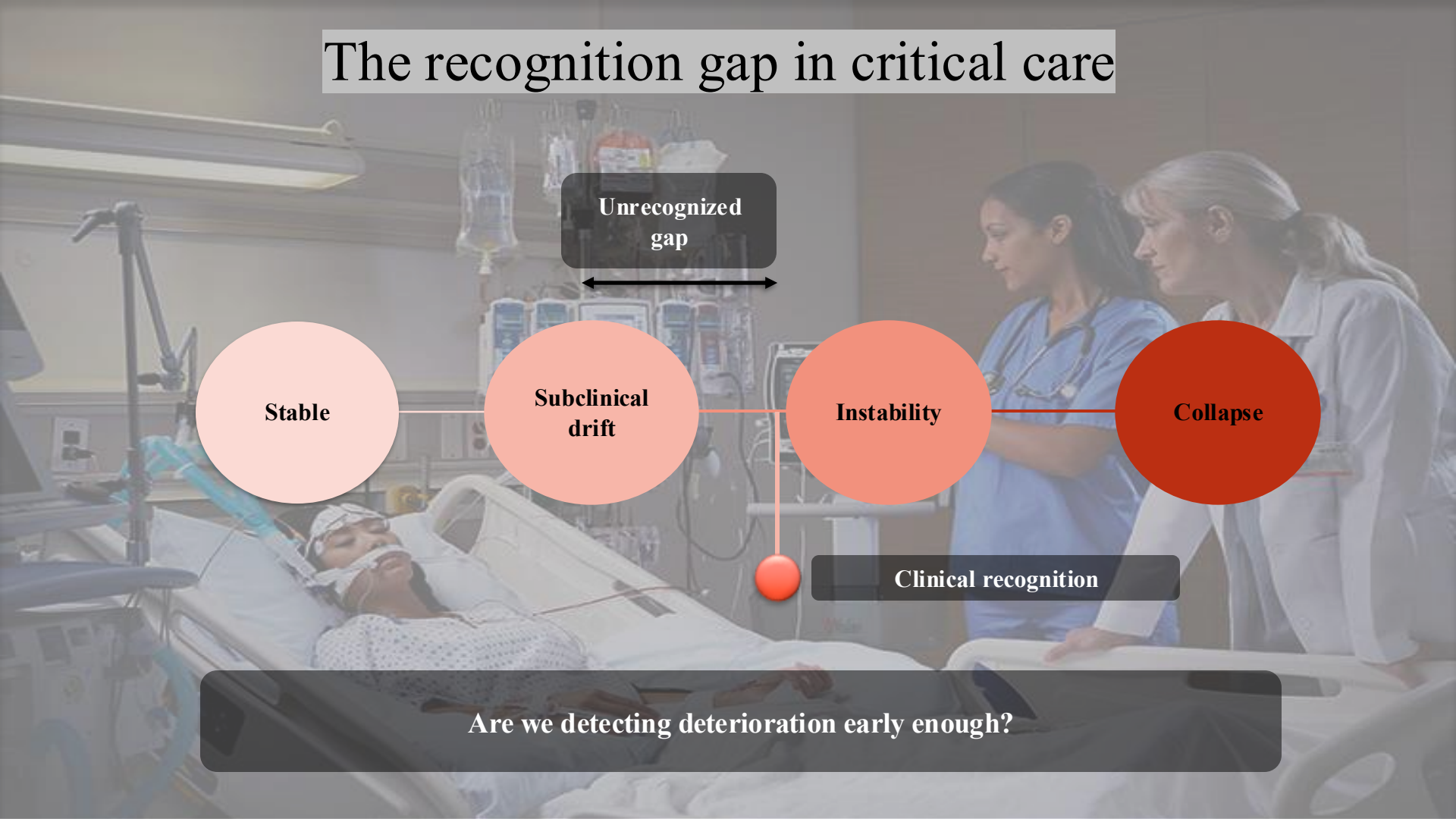
SOFA / APACHE



Admission→24 hr data → score→ mortality %

- **Fixed early time window**
- **Predefined threshold-based variables**
- **Linear relationships assumed**
- **Snapshot based assessments**

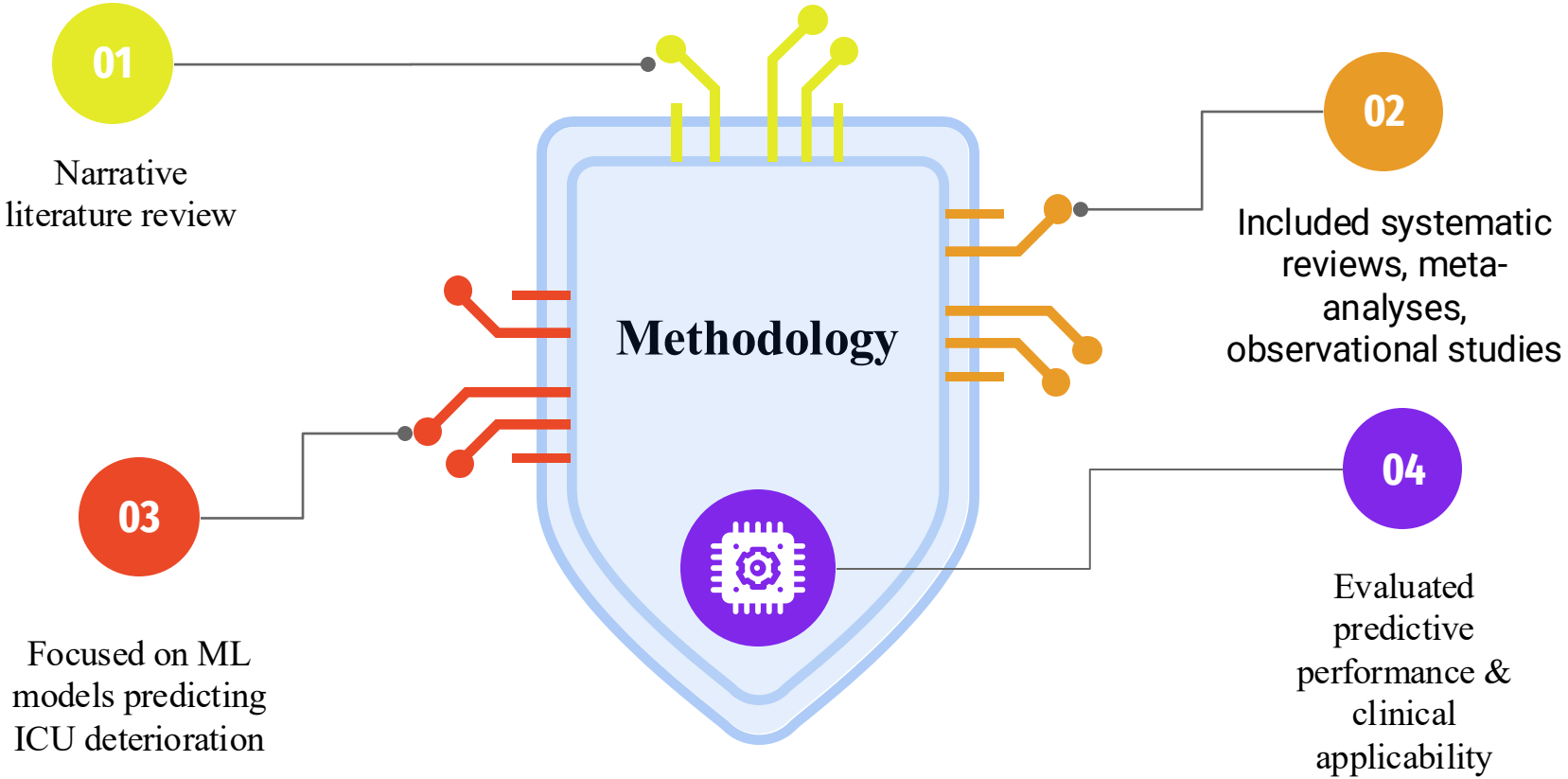
The recognition gap in critical care



Are we detecting deterioration early enough?

Aim of the review

To analyze the predictive performance, clinical applications & real world implementation challenges of machine learning in critical care


01
Narrative literature review
02
Included systematic reviews, meta-analyses, observational studies
Methodology
03
Focused on ML models predicting ICU deterioration
04
Evaluated predictive performance & clinical applicability

What is machine learning ?

01

Learns patterns from large clinical data sets

02

Integrates multiple physiological variables

03

Identifies complex non-linear relationships

04

Generates probalistic risk estimates

Traditional scoring Vs Machine Learning

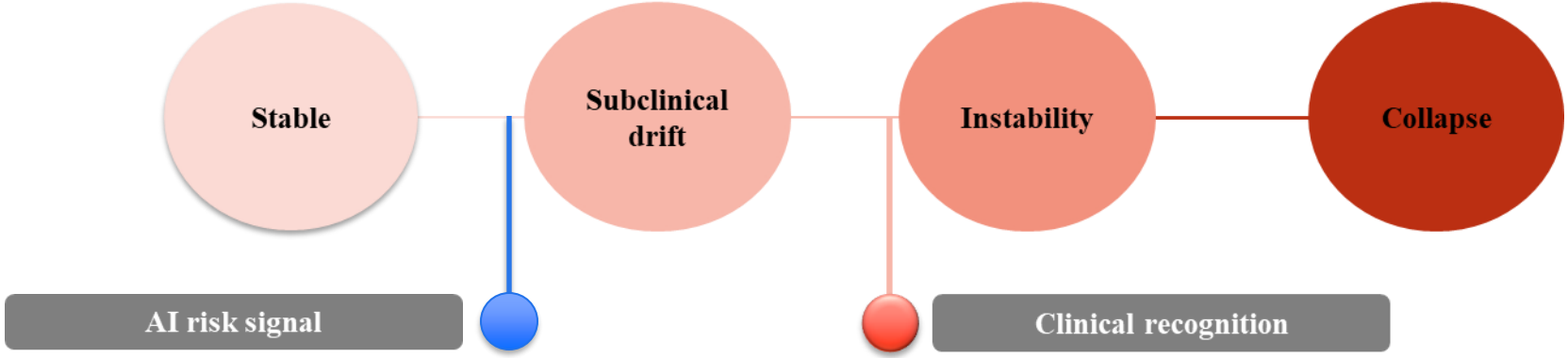
Traditional scoring

- Predefined variables
- Linear regression based
- Fixed time window
- Static risk output

Vs

Machine learning

- Learns from large datasets
- Captures non-linear relationships
- Integrates multi-dimensional data
- Generates probabilistic risks



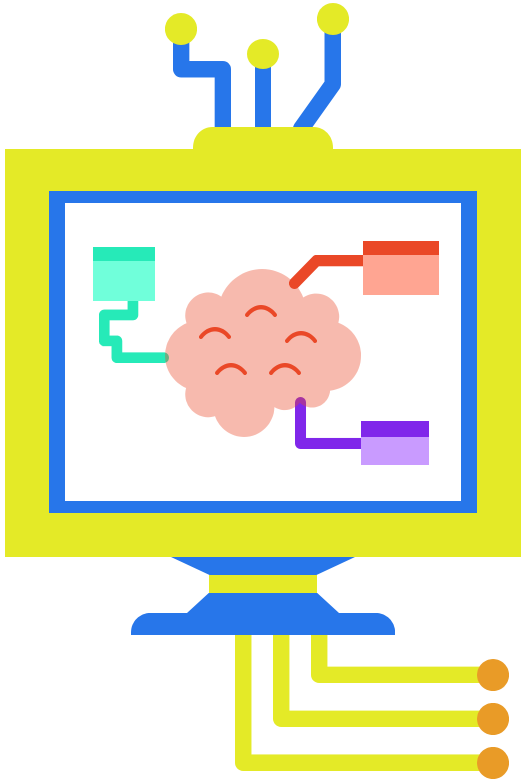
Results : Predictive performance

01 AUC values : 0.77 – 0.95

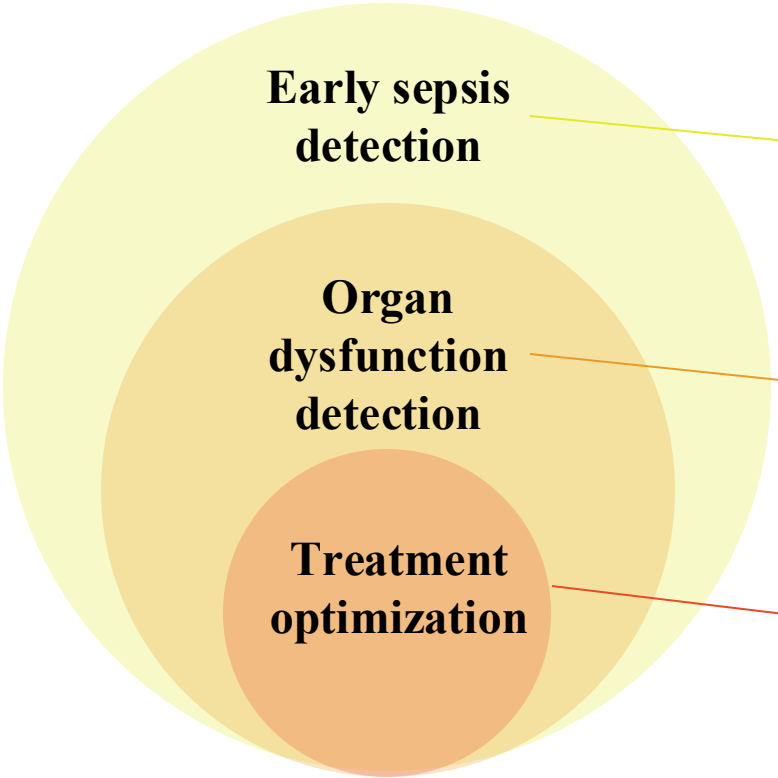
02 Predictive window : 6 – 72 hrs before clinical recognition

03 Outperforms traditional scoring systems

04 Best performing models : XGBoost, Random Forest



Clinical applications



- Structure + unstructured data improves detection : 48 hrs before
- Structured data alone : 12 hrs before

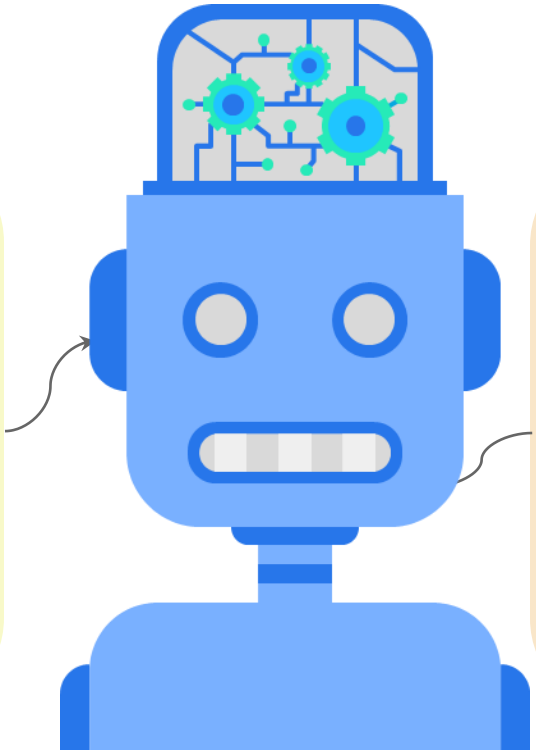
- ARDS : 24 – 48 hrs before
- VAP : 24 hrs before
- AKI : 24-48 hrs before

- Ventilator optimization
- ARDS phenotyping
- ECMO selection

Translational challenges & future directions

Current gaps (Limitations)

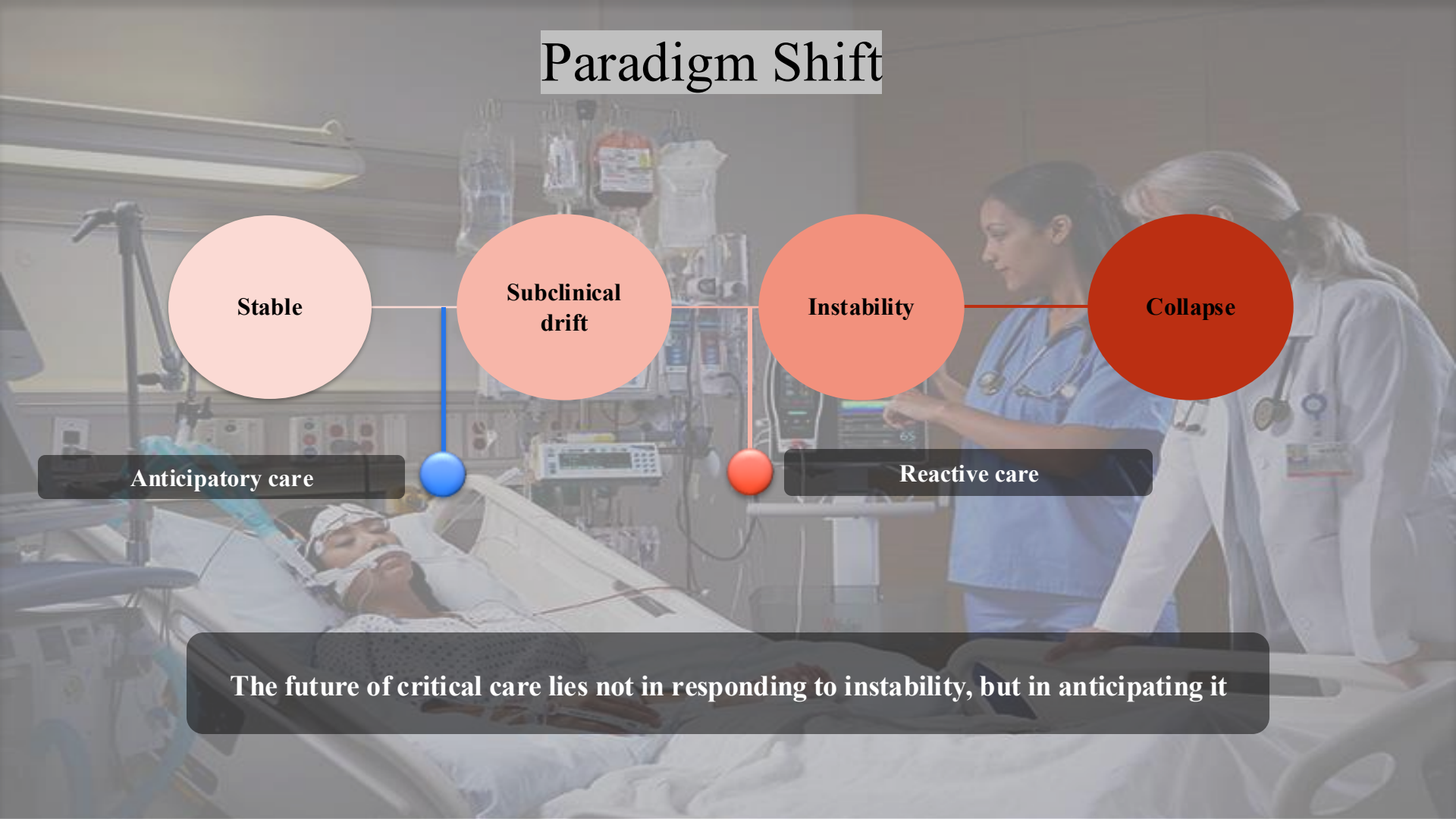
- Retrospective evidence predominates
- Limited external validation
- Workflow integration barriers
- Calibration & bias concerns



The way forward (Solutions)

- Prospective multicenter validation
- Real time embedded decision support
- Explainable AI frameworks
- Federated & multimodal learning

Paradigm Shift



The future of critical care lies not in responding to instability, but in anticipating it

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thank you